According to this theory, the germ plasm, more especially through the chromatin fibres, is the conveyer of hereditary structure and properties from generation to generation. Further, he holds that the cells, tissues, and organs, which make up the somatic or personal structure of the individual, exercise no modifying influence on the germ or reproductive cells situated in the body of that individual, which cells are also, he thinks, unaffected by the conditions, habits, and mode of life. In its fundamental idea Weismann's theory is in harmony with one propounded a few years earlier by Mr. Francis Galton (Proc. Roy. Soc. London, 1872; and Journ. Anthrop. Inst., vol. v., 1876).

In an address delivered at Newcastle in September last to the Anthropological Section of the British Association (NATURE, September 26, 1889), I reviewed this theory of heredity, and, whilst finding in it much with which one could coincide, I directed attention to points to which, I thought, objection might be taken. More especially I took exception to the idea that the germ plasm was so isolated from the cells of the body generally as to be uninfluenced by them, and to be unaffected by its surroundings.

On this occasion I propose to say a few words on the bearing of this theory on the development of the tissues and organs of the individual. If we examine the development of the embryo, say of one of the Vertebrata, we find that it makes a certain advance, varying in its time and extent according to the species, without any differentiation of a reproductive organ with its contained germ plasm being discoverable. I shall not enter into the much-disputed question of the layer or layers of the blastoderm from which the reproductive cells take their rise. But I may say that in the chick, both in the third and fourth day of incubation, a layer of germinal epithelium may be seen in close relation to the Wolffian duct and the pleuro-peritoneal cavity. At the end of the fourth day or in the fifth day this epithelium becomes thickened, and the primordial ova appear in it as distinctly differentiated cells. In the rabbit a corresponding differentiation does not appear to take place before the twelfth or thirteenth day. Up to the period of differentiation of the primordial ova, no isolation or separation of the reproductive cells and germ plasm has taken place; and, so far as observation teaches, there is nothing to enable one to say which cells of the blastoderm may give rise to primordial ova, or which may differentiate into cells for other histogenetic purposes. But before the germ cells appear, the rudiments of the nervous, vascular, skeletal, muscular, tegumentary, and alimentary systems, and the Wolffian bodies or primordial kidneys have all been mapped out. Up to this time, therefore, in all probability, a more or less complete diffusion of the germ plasm throughout either one or more of the layers of the blastoderm has taken place. The hereditary influence conveyed by the germ plasm would thus be brought to bear upon the cells of the blastoderm generally, so as to impart to them the power of undergoing at the appropriate period the morphological and chemical differentiation to form the several tissues. As the tissues and organs are derived through division of the nuclei from the cells of the blastoderm, the continuity of the hereditary influence exercised over them is kept up, even after the germ plasm has become isolated, and the entire organism is moulded so that it acquires its specific and individual characters.[1]

But the diffusion of the germ plasm throughout either the whole of the blastoderm, or a part thereof, of necessity so intimately associates it with the formative cells of the tissues generally, that it is difficult, if not impossible, to comprehend how in its turn it can be unaffected by them. Before, therefore, it again becomes stored up or isolated in an individual, in the form of ova or sperm cells, it has in its stage of diffusion been brought under precisely the same influences as those which in the embryo affect the formative cells of the whole body.

From the observations and reasoning of Wilhelm His (Proc. Roy. Soc. Edin., April 2, 1888), there can, I think, be no question that the layers of the blastoderm are affected by pressures and other mechanical conditions. These pressures would produce or modify flexures, or occasion a diminution in dimensions in some directions and an increase in others; and in this way would tend to affect either the form of the entire organism, or the form and relations of its constituent parts, or perhaps both. Should such modifying influences come into operation either before the isolation of the germ plasm, or when it was in a plastic or impressionable condition, one could conceive that it might be affected by them. Molecular changes might thus be induced in the germ plasm of such a kind as to modify the properties of the chromatin constituent of the nuclei, so as to induce in it and the germ plasms descended from it corresponding modifications, which would become hereditary. If such an hypothesis be granted, it would follow that the external conditions would exercise a perceptible influence on the germ plasm of the reproductive cells, both in the individual in which they first manifested their effect and in the generations which are descended from him.

If the germ plasm, from the first stage of development of each organism, were completely isolated from the cells from which all the other cells of the body were produced, it would be possible to conceive its transmission from generation to generation unaffected by its surroundings. But as in each individual a stage of diffusion or non-isolation precedes that of differentiation into the special reproductive apparatus, it follows that the conditions which would secure the germ plasm and the soma cells from mutual interaction are not complied with. On this ground, therefore, as well as for the reasons previously advanced in my Newcastle address on heredity, I am unable to accept the proposition that there can be no transmission to the offspring, through the reaction of the soma on the germ plasm, of characters which may be acquired under direct external influences. But in questioning the accuracy of the proposition that somatogenic "acquired characters" are incapable of being transmitted, I do not of course contend that all the characters which may be acquired during the lifetime of an individual are perpetuated in his descendants.

THE LABORATORY OF VEGETABLE BIOLOGY AT FONTAINEBLEAU.

THIS Laboratory, the establishment of which we have already announced, has now been in full working order, as far as the present buildings will permit, since May 15. We are enabled to furnish our readers with the following account of its scope and design, with the accompanying sketches, from an article supplied by M. Jumelle to the *Révue Générale de Botanique*.

The Laboratory was established at the suggestion of M. Liard, the Director of Higher Instruction in France, and is regarded as an *annexe* of the Botanical Laboratory of the Faculty of Sciences at the Sorbonne, being under the direction of M. Gaston Bonnier, the Professor of Botany at the Sorbonne. Its foundation was due to a consideration of the difficulties which necessarily attach to culture-experiments and physiological researches when carried on in large towns. For these purposes an advantageous locality presented itself in Fontainebleau, with the rich herbaceous and arborescent flora of the neighbouring forest, an abundant supply of water, and ready access to Paris. A portion of the forest (see Fig. 1) is inclosed within the territory attached to the Laboratory.

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[1] On the question of the influence exercised by the germ plasm on the tissues, I may refer to some most suggestive remarks by Sir James Paget, published forty years ago, in the *London Medical Gazette*, 1849, in one of his lectures (VI.) on "The Processes of Repair and Reproduction after Injuries:"—"In every impregnated germ we must admit that properties are implanted which, in favourable conditions, issue in the power to form, of the germ and the materials it appropriates, a being like those from which it sprang. And, mysterious as it may seem, yet must we conclude that a measure of those properties is communicated to all the organic materials that come within the influence of the germ; so that they, being previously indifferent, form themselves in accordance with the same specific law as that to which the original materials of the germ are subject. So through every period of life the same properties transmitted and diffused through the whole organism are manifested in the determination of its growth and maintenance, in its natural degeneration, and its repair of every part, in accordance with that type or law which has prevailed in every individual of the species." See also a lecture "On the Formative Process," in "Lectures on Surgical Pathology," vol. i., London, 1853.

It is intended in the future to make important additions to the building at present constructed. The room for experimental researches is represented by S in Fig. 2; it will accommodate 24 workers. Those who are engaged in microscopical researches, or the study of the lower forms of vegetable life, work in galleries placed at about one-half the height of the room; the floor is intended for physiological experiments, which, with the necessary apparatus, require a larger space. Here are placed the instruments required for the study of vegetable chemistry—furnaces, balances for delicate work, glycerin-troughs, apparatus for sterilization, &c.; others will be added as needed. Opening out of this hall (B and P, Fig. 2) are the director's room and the library. Other rooms (A, A, Figs. 2 and 3) are occupied by M. Duval, the director of cultures; and on the upper story are chambers for some of the students. In the grounds attached are frames (C, Fig. 1), and a greenhouse (S) divided into a hot and cold portion; in the latter is placed apparatus necessary for physiological experiments.

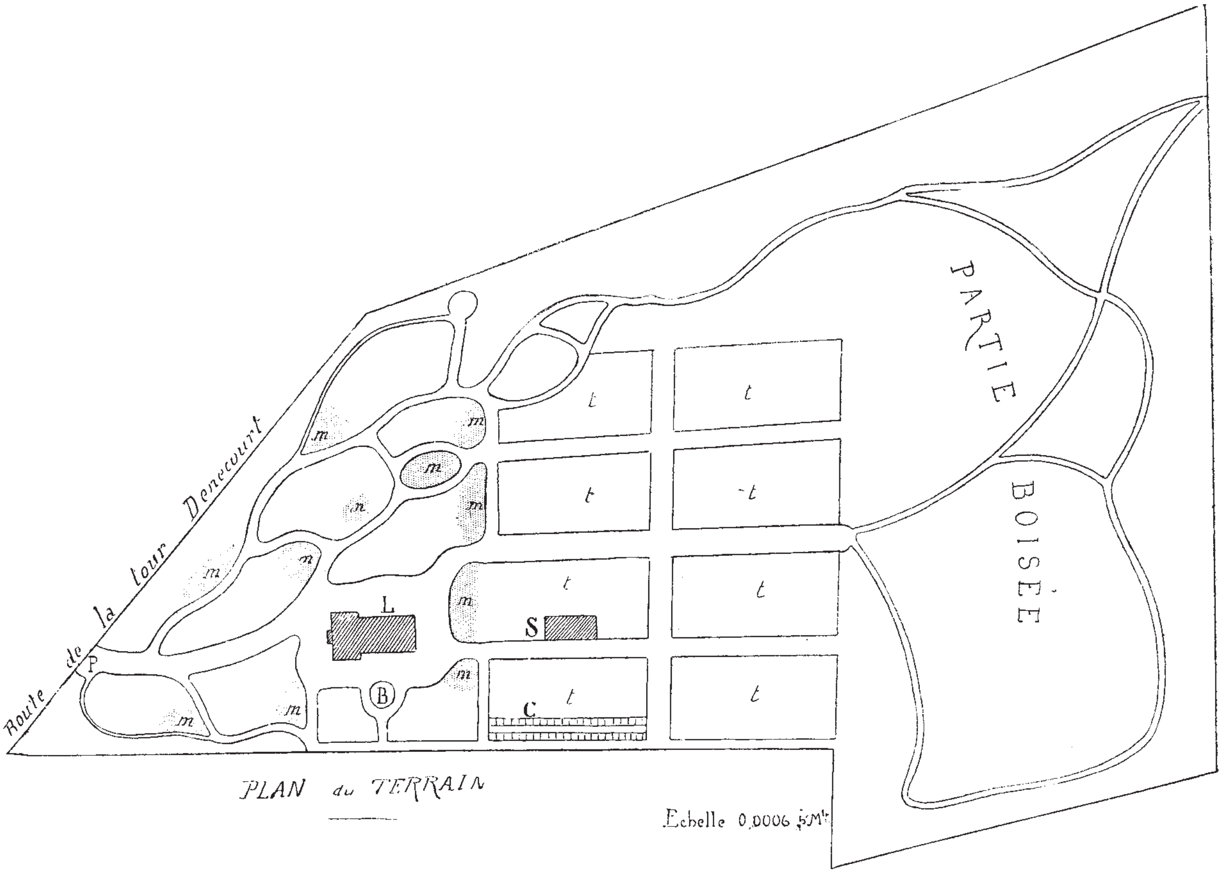
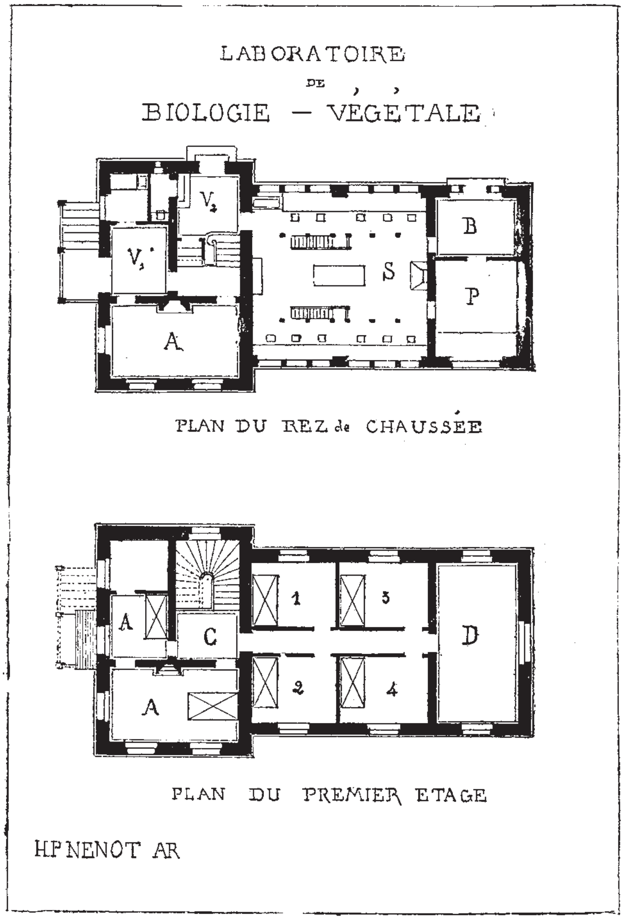


FIG. 1.—Plan of the grounds attached to the Laboratory (2½ hectares). P, entrance; L, building, S, greenhouse; C, frames; B, basin; *m m*, clumps of trees; *t t*, plots for experimental culture.

One object aimed at by the establishment of the Laboratory is to provide facilities, already afforded in the case of animals in zoological laboratories, for the study of plants in the localities and under the conditions in which they are found in Nature. Hitherto, experiments in vegetable physiology have been mainly carried out on specimens which have been transplanted for the purpose, and which are therefore subjected to unfavourable or unnatural conditions of light, air, soil, &c., which may materially invalidate the results. This objection applies largely to experiments carried on in botanic gardens. To meet this difficulty, a portion of the actual forest (see Fig. 1) has been inclosed within the precincts of the Laboratory; and numerous plots (*t*, *t*) are also set apart for experimental cultures. In the former are a number of trees and herbaceous plants growing in their natural habitat in all stages of development. It is hoped that in this way much light will be thrown on the diseases, whether due to the attacks of parasites or to unfavourable vital conditions, to which plants are subject. It is intended that the culture-plots shall not be devoted exclusively to the use of students in the Laboratory, but that other experiments shall be carried on by M. Duval at the desire of, and under the conditions prescribed by, outside workers. The study of vegetable pathology, and especially of the diseases which attack vines and forest-trees, is one of the special objects for which the Laboratory has been established; and, to aid in these researches, relations have already been opened with horticulturists and viticulturists, and with the Administration of Forests; and the occupiers of neighbouring estates have placed their resources at the disposal of the director.

In addition to the Laboratory at Fontainebleau, a new one is also being built at the Sorbonne itself, with a large lecture-room, galleries for collections, a library, a greenhouse, a photographic room, and twelve work-rooms.



FIGS. 2, 3.—Ground floor: V V, vestibules; S, hall for research; P, Director's laboratory; B, library. First floor: C, landing: D, 1, 2, 3, 4, chambers for students; A A, rooms of the director of cultures.

The Director of the Laboratory at Fontainebleau offers a cordial invitation to foreign botanists who may desire to avail themselves of the facilities for work afforded by it.

BENJAMIN FRANKLIN.

THE Official Report, issued by the American Philosophical Society, of the celebration of the centennial anniversary of the death of Benjamin Franklin, April 17, 1890, has just been sent to us. The Society, in January last, held a stated meeting, at which it was resolved to form a Committee of five members, to be appointed by the President, who should be empowered to take all necessary action. The following was the form of the resolution that was drawn up by the Committee:—"That we commemorate in a becoming way the approaching centennial anniversary of the death of Benjamin Franklin, and that a series of short addresses upon his life, character, and work be delivered before the Society upon this occasion."

The Society is to be congratulated on the success with which the idea was carried out. It is right that the world, on fitting occasions, should be reminded of the achievements of so great an investigator. Franklin had all the qualities of mind which are necessary for the extension of knowledge by means of observation and experiment, and his career marked one of the most important stages in the development of science. Englishmen regard his work with hardly less pride than Americans, and the memory of what he accomplished must always be one of the links that serve to unite the two peoples.

In the evening of the anniversary day, members and their guests assembled at the Association Hall in the city of Philadelphia. Mr. Talcott Williams began the proceedings with a few remarks on the occasion of the gathering. He then informed the audience that the Society had summoned the biographer of Franklin; it had called upon the historian of the land in which he served his country, upon the man of science, upon one who was both the man of science and of letters, and lastly upon the President of the Society, to represent the civic and associated activities in which Franklin was engaged.

In the following notes we shall give brief extracts from some of the speeches that were delivered. Franklin, the youngest son of a family of seventeen, began his career at Boston. He wished to go to sea, but his mother thought it would be better for him to become a minister. His father, having tried hard to make him a tradesman, bound him over to an elder brother to learn printing. The apprenticeship did not last long, as the brothers disagreed, and what with insults, quarrels, and blows, they parted—"the one to drag out a humble existence, the other to become the most illustrious American of his day." Travelling about looking for work, Franklin came across William Keith, who sent him to Boston, and then to London. On reaching the latter place he found out that "Keith was a knave, and himself a dupe." During his stay in London he wasted his substance, misused money, and kept bad company; but after some time he made the acquaintance of a merchant, who gave him a situation. Going back to Philadelphia with him, he commenced to "keep books, sell goods, and learn the secrets of mercantile affairs." Owing to the death of the merchant, Franklin was once more at large, and this time, with the help of a friend, he set up a "new printing office in High Street near the market."

From that hour he prospered, bought out his partner, married, founded one of the best newspapers, published the famous almanac, and was made Postmaster-General. Having now become wealthy by a strict adherence to the maxims of "Poor Richard," he sold his shop, newspaper, &c., and gave his time to the study of science. Before he had reached the age of fifty he had won for himself the Copley Medal, and membership of the Royal Society.

He now dropped scientific studies and returned to politics, and was loaded with public duties. Among other things he was appointed Postmaster-General of the Colonies, sent by the Assembly with its Speaker to hold a conference with the Indians at Carlisle, and then to the Albany Conference, where he presented his famous plan of union. On his return to Philadelphia in 1761, his intention was to settle down again and study, but he was again drawn into politics by the conspiracy of Pontiac, and the massacre of the Conestoga Indians by the men of Donegal and Paxtang.

After this he wrote many articles on American affairs for the English newspapers, and it was about this time that he republished a London edition of the "Famous Letters," and brought out "The Votes and Proceedings of the Freeholders and other Inhabitants of